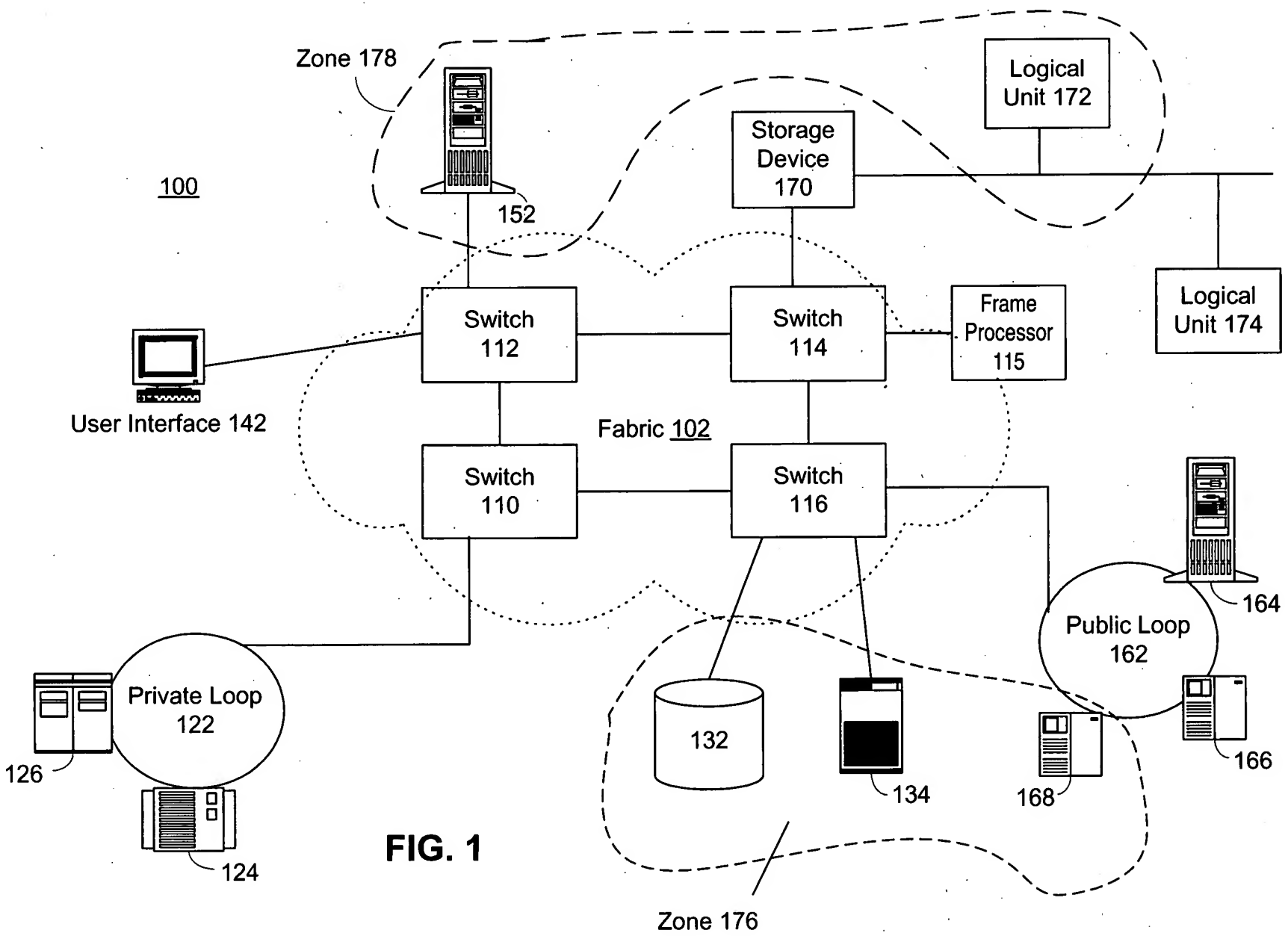

Zone 178
Logical Unit 172
Storage Device 170
100
152
Switch 112
Switch 114
Frame Processor 115
Logical Unit 174
User Interface 142
Fabric 102
Switch 110
Switch 116
164
Public Loop 162
Private Loop 122
126
132
134
168
166
124
Zone 176

FIG. 1

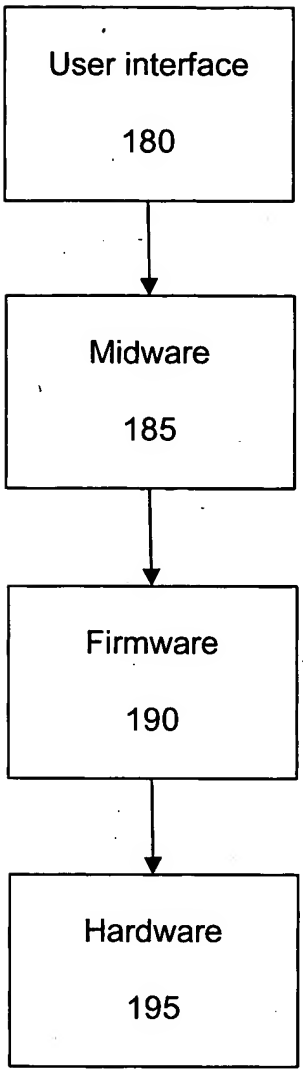
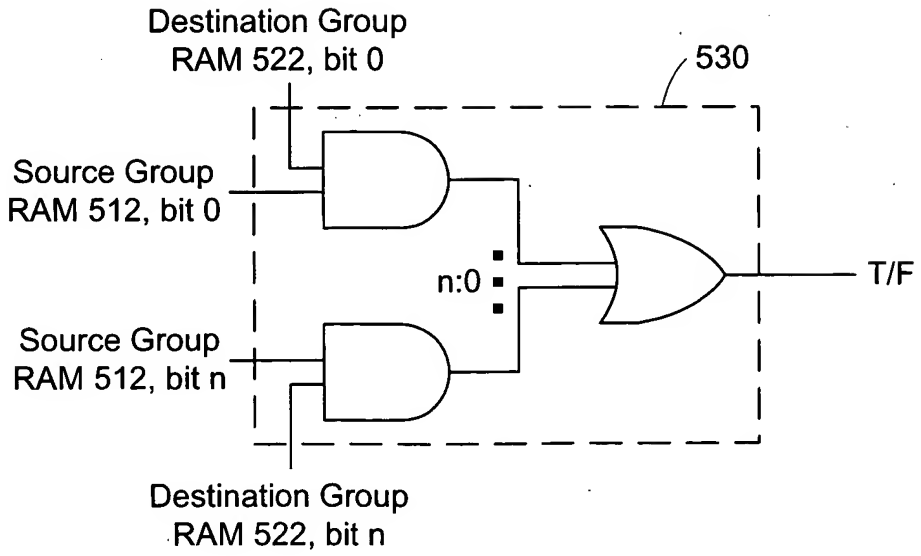

User interface
180
Midware
185
Firmware
190
Hardware
195

FIG. 2

FIG. 9B


Destination Group
RAM 522, bit 0
530
Source Group
RAM 512, bit 0
n:0
T/F
Source Group
RAM 512, bit n
Destination Group
RAM 522, bit n

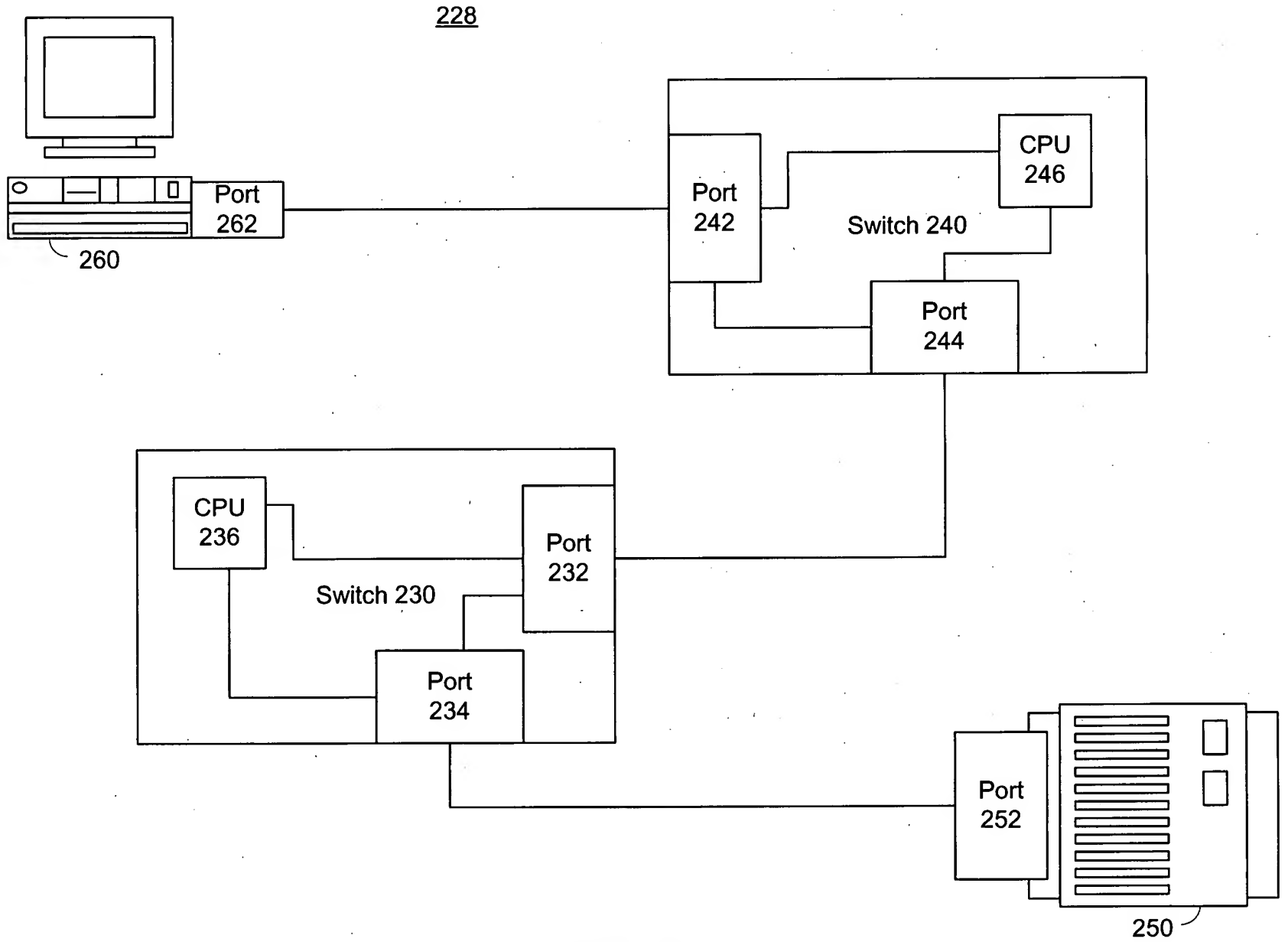

228
Port
262
260
Port
242
CPU
246
Switch 240
Port
244
CPU
236
Port
232
Switch 230
Port
234
Port
252
250

FIG. 3

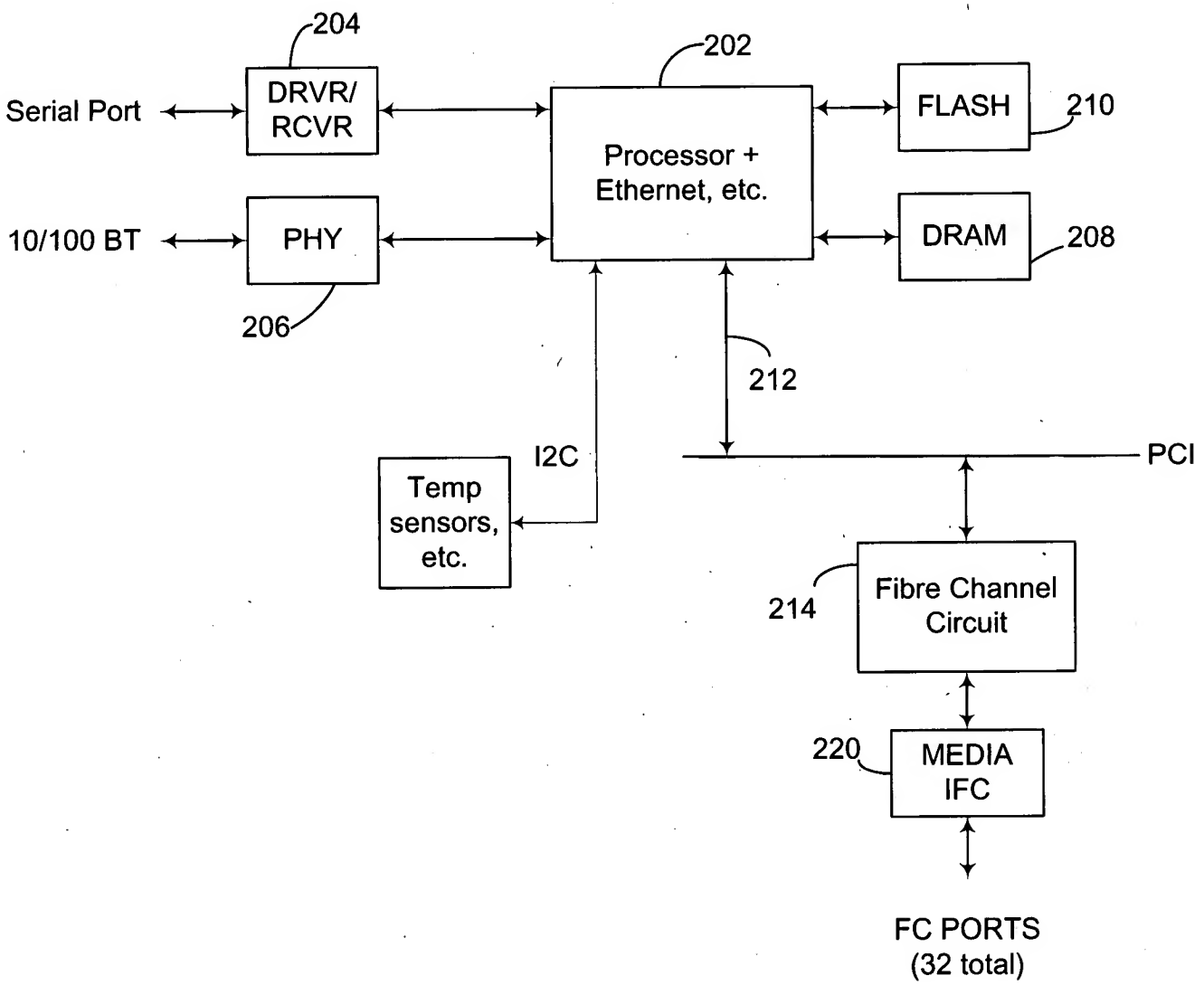

204
202
Serial Port
DRVR/
RCVR
Processor +
Ethernet, etc.
FLASH
210
200
10/100 BT
PHY
DRAM
208
206
212
I2C
PCI
Temp
sensors,
etc.
214
Fibre Channel
Circuit
220
MEDIA
IFC
FC PORTS
(32 total)

Fig. 3A

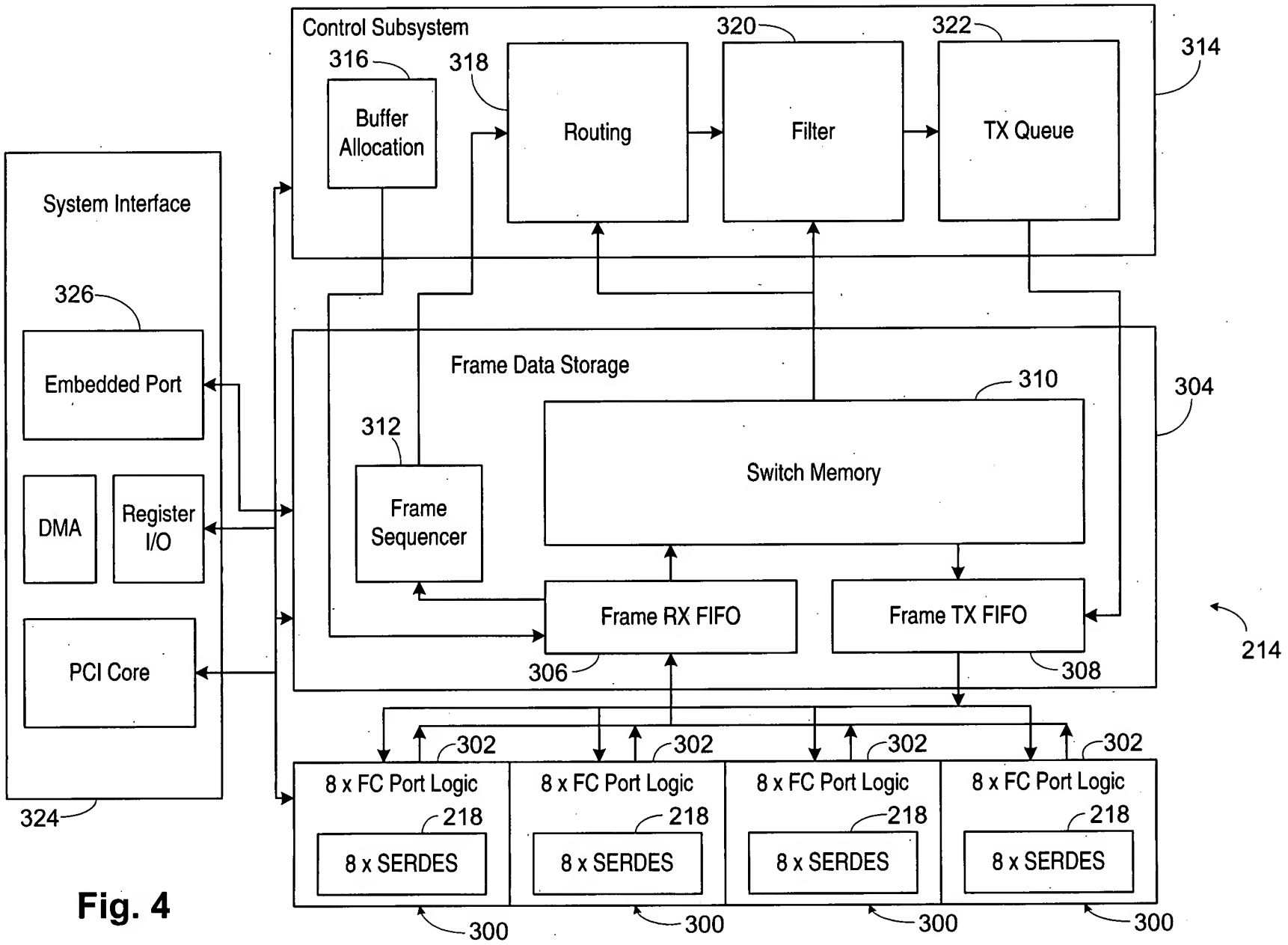

Control Subsystem
316
Buffer Allocation
318
Routing
320
Filter
322
TX Queue
314
System Interface
326
Embedded Port
DMA
Register I/O
PCI Core
324
Frame Data Storage
310
Switch Memory
312
Frame Sequencer
304
Frame RX FIFO
306
Frame TX FIFO
308
214
302
8 x FC Port Logic
218
8 x SERDES
300

Fig. 4

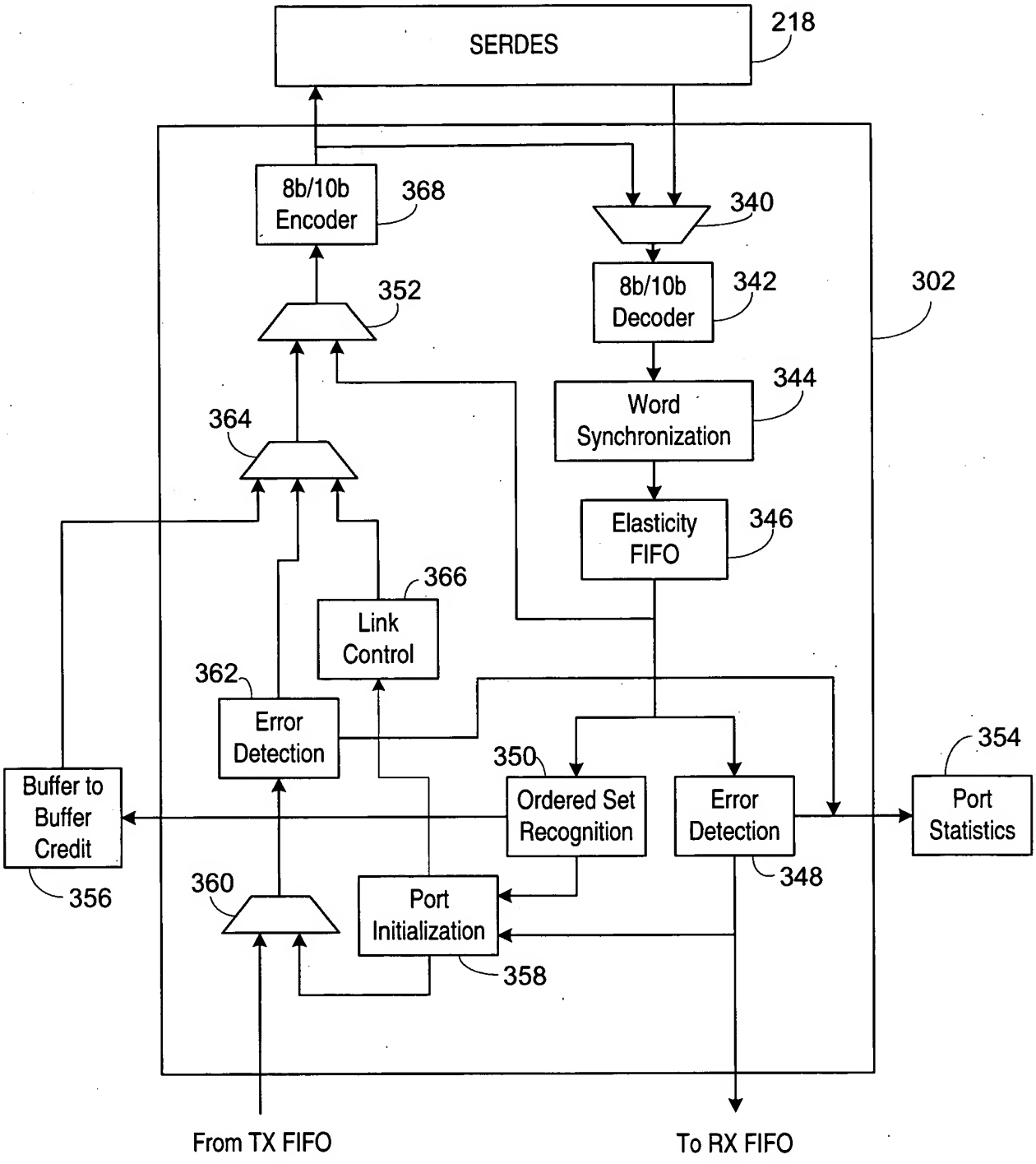

SERDES
218
8b/10b Encoder
368
340
8b/10b Decoder
342
302
352
Word Synchronization
344
364
Elasticity FIFO
346
366
Link Control
362
Error Detection
350
354
Buffer to Buffer Credit
Ordered Set Recognition
Error Detection
Port Statistics
356
360
348
Port Initialization
358
From TX FIFO
To RX FIFO

Fig. 4A

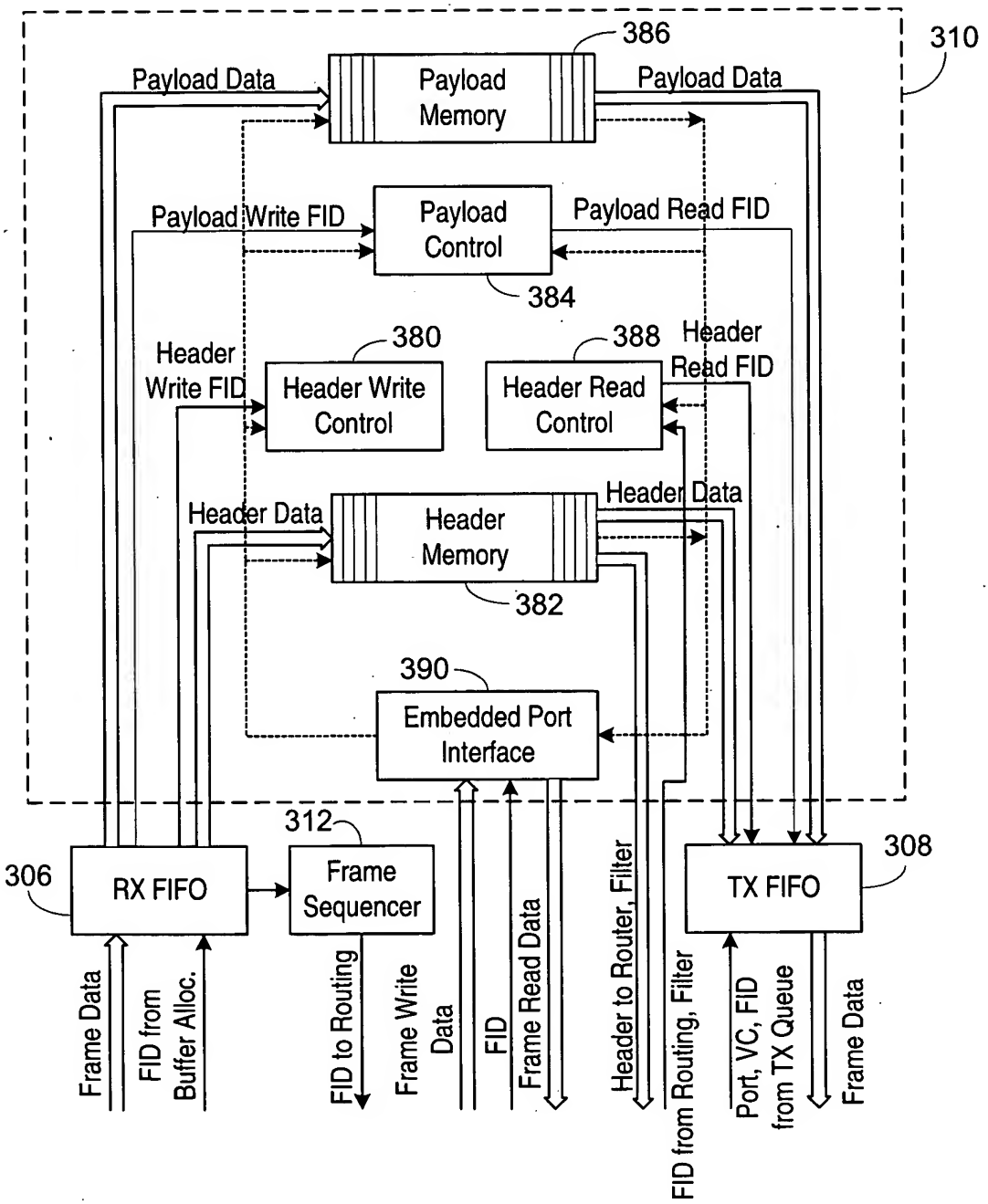

310
386
Payload Data
Payload Memory
Payload Data
Payload Write FID
Payload Control
Payload Read FID
384
380
388
Header Write FID
Header Write Control
Header Read Control
Header Read FID
Header Data
Header Memory
Header Data
382
390
Embedded Port Interface
312
306
RX FIFO
Frame Sequencer
308
TX FIFO
Frame Data
FID from Buffer Alloc.
FID to Routing
Frame Write Data
FID
Frame Read Data
Header to Router, Filter
FID from Routing, Filter
Port, VC, FID from TX Queue
Frame Data

Fig. 4B

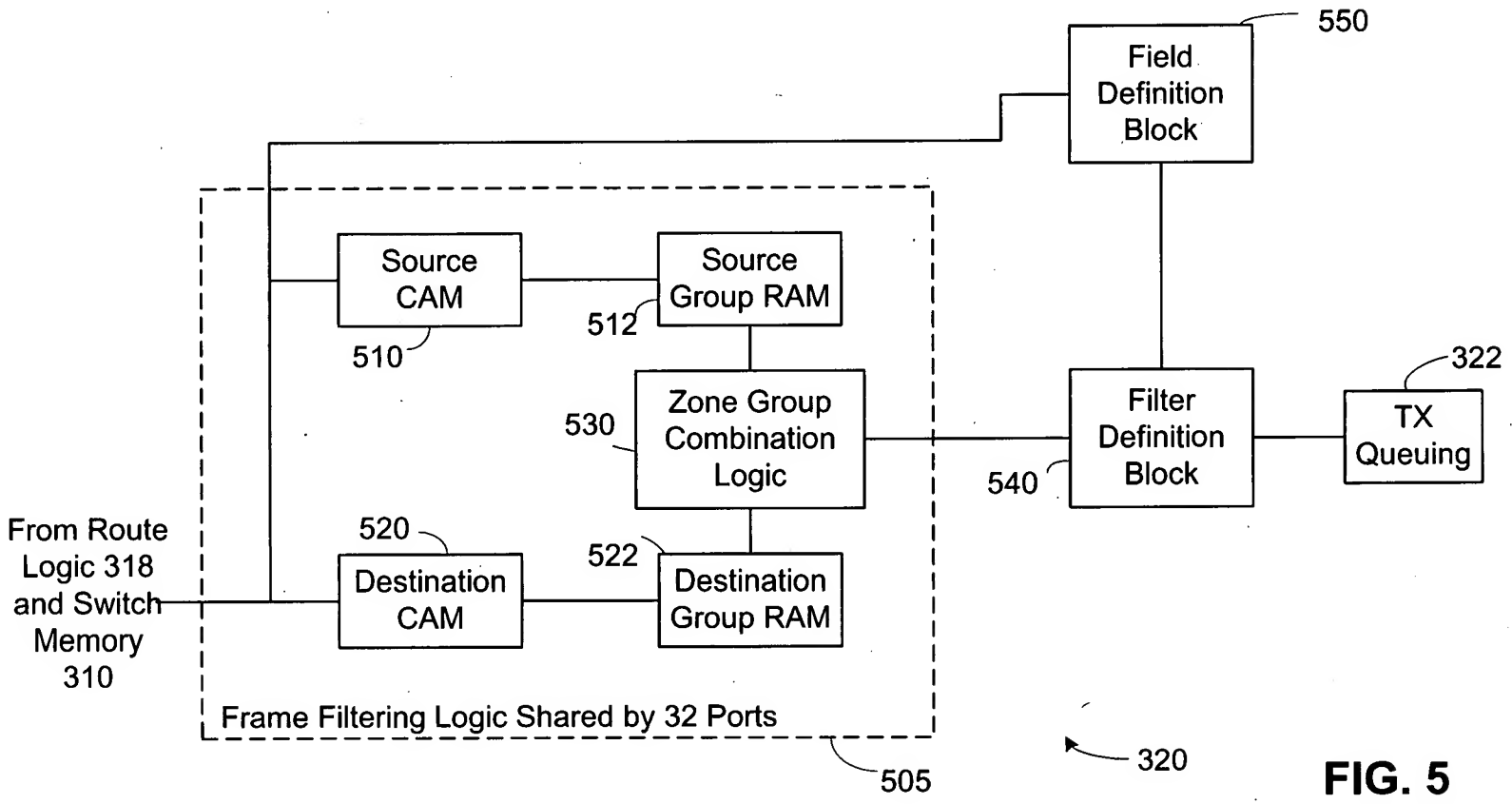

550
Field Definition Block
Source CAM
510
Source Group RAM
512
Zone Group Combination Logic
530
Filter Definition Block
540
322
TX Queuing
520
Destination CAM
522
Destination Group RAM
From Route Logic 318 and Switch Memory 310
Frame Filtering Logic Shared by 32 Ports
505
320

FIG. 5

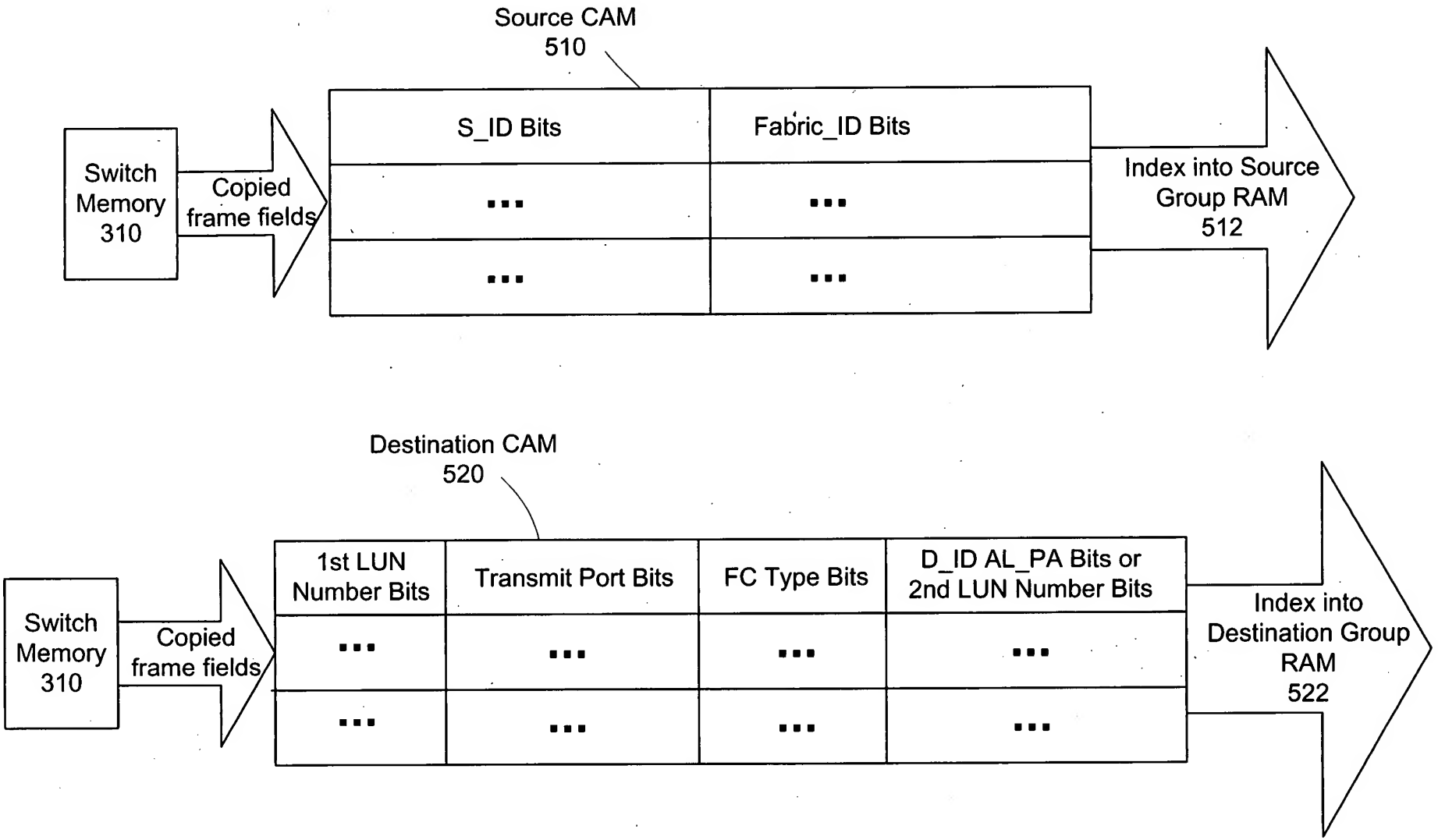

Source CAM
510
Switch Memory 310
Copied frame fields
S_ID Bits
Fabric_ID Bits
Index into Source Group RAM 512
Destination CAM
520
Switch Memory 310
Copied frame fields
1st LUN Number Bits
Transmit Port Bits
FC Type Bits
D_ID AL_PA Bits or 2nd LUN Number Bits
Index into Destination Group RAM 522

FIG. 6

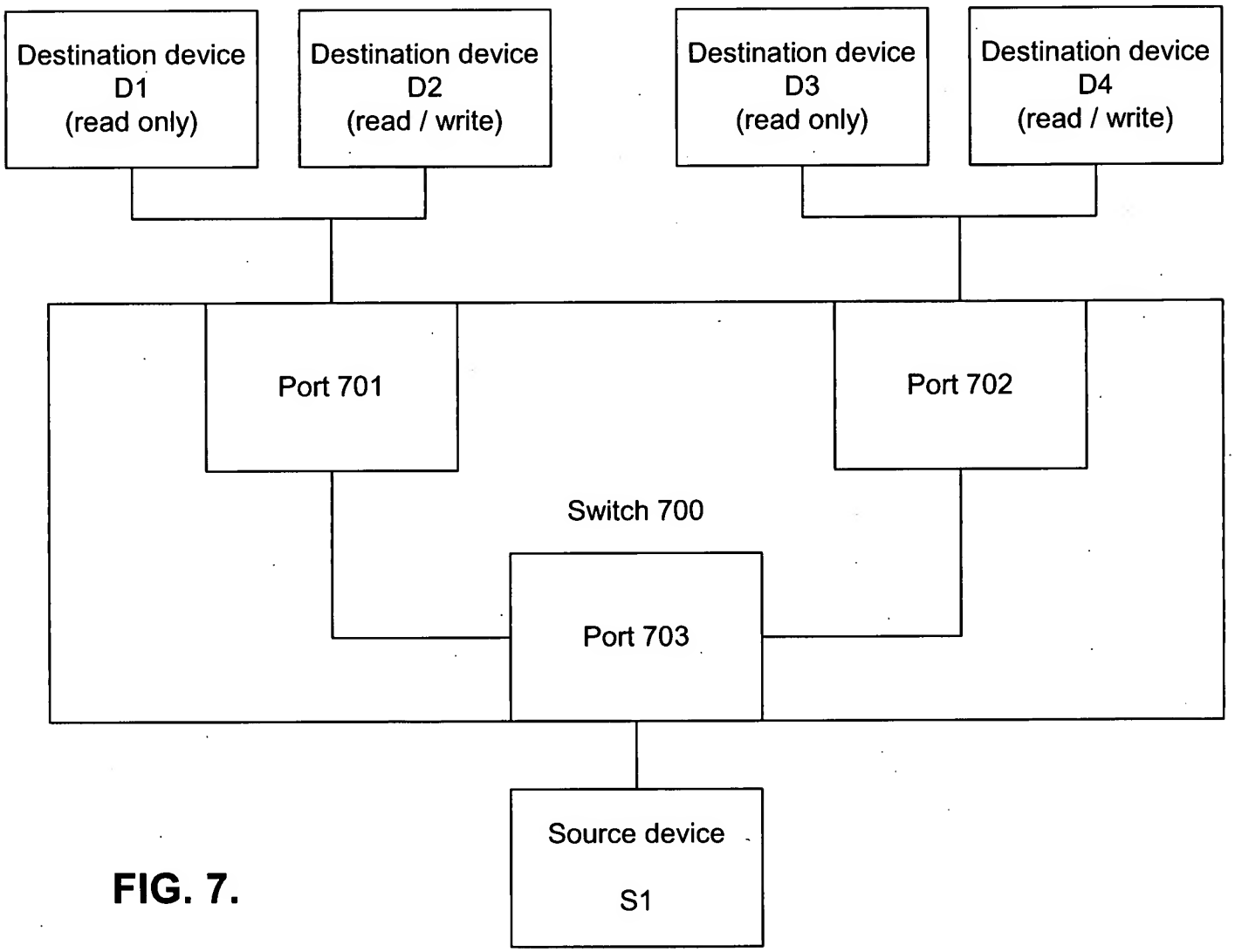

Destination device
D1
(read only)
Destination device
D2
(read / write)
Destination device
D3
(read only)
Destination device
D4
(read / write)
Port 701
Port 702
Switch 700
Port 703
Source device
S1

FIG. 7.

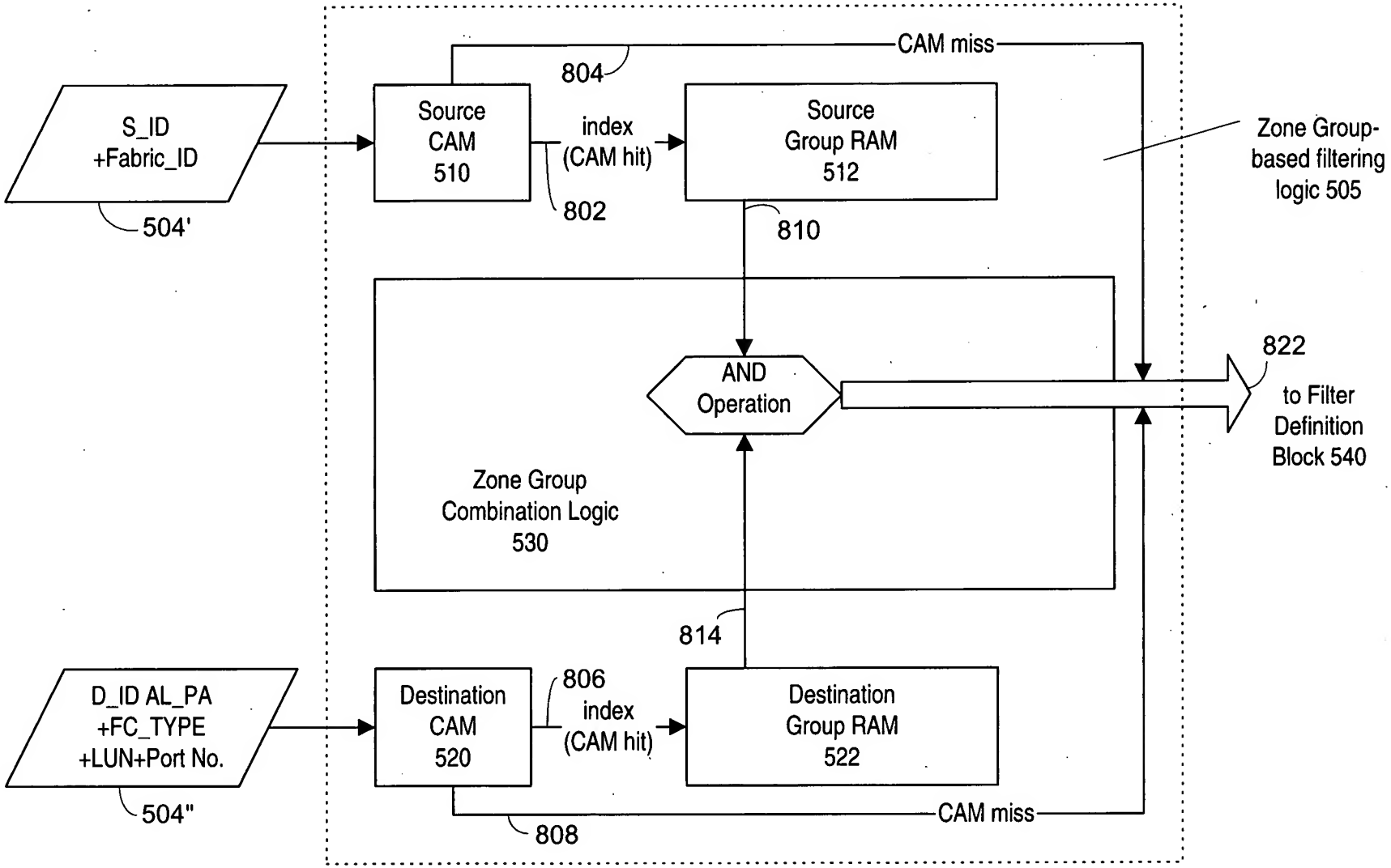

CAM miss
804
S_ID
+Fabric_ID
Source
CAM
510
index
(CAM hit)
Source
Group RAM
512
Zone Group-
based filtering
logic 505
504'
802
810
822
AND
Operation
to Filter
Definition
Block 540
Zone Group
Combination Logic
530
814
D_ID AL_PA
+FC_TYPE
+LUN+Port No.
Destination
CAM
520
806
index
(CAM hit)
Destination
Group RAM
522
504"
CAM miss
808

FIG. 8

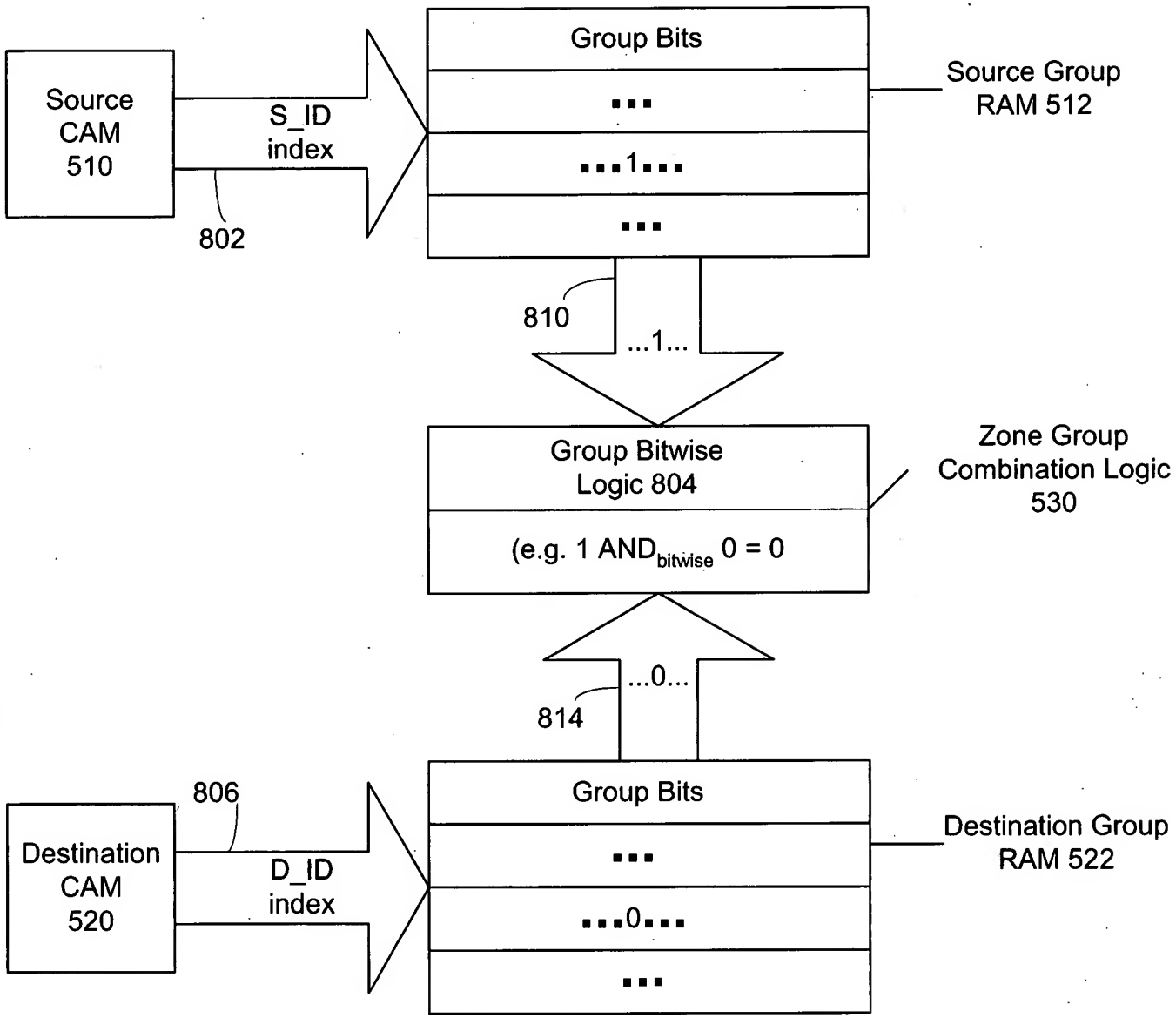

Source CAM 510
S_ID index
802
Group Bits
...
...1...
...
Source Group RAM 512
810
...1...
Group Bitwise Logic 804
(e.g. 1 AND bitwise 0 = 0
Zone Group Combination Logic 530
...0...
814
806
Destination CAM 520
D_ID index
Group Bits
...
...0...
...
Destination Group RAM 522

FIG. 9A

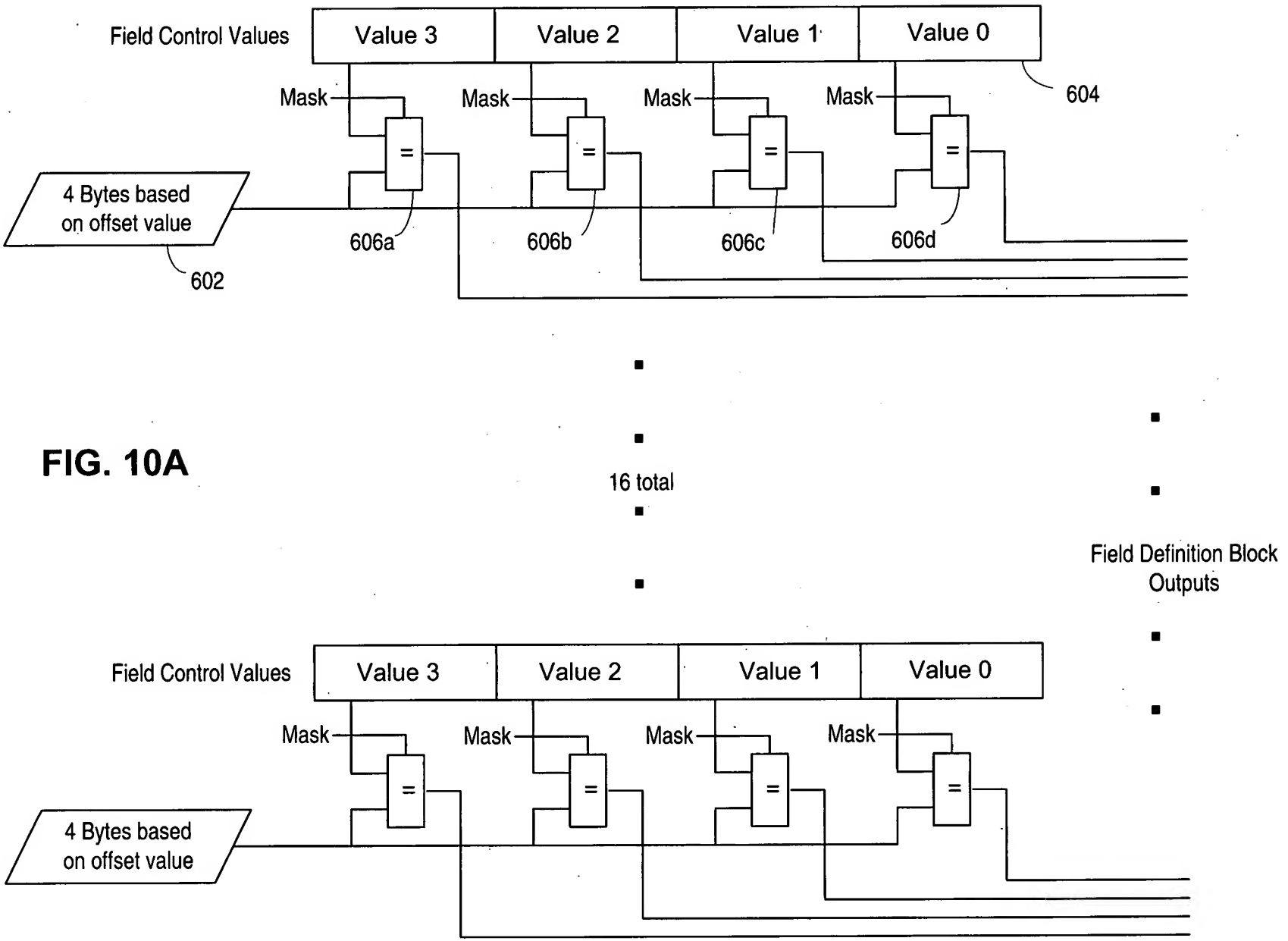

Field Control Values
Value 3
Value 2
Value 1
Value 0
604
Mask
Mask
Mask
Mask
=
=
=
=
4 Bytes based on offset value
602
606a
606b
606c
606d
16 total
Field Definition Block Outputs
Field Control Values
Value 3
Value 2
Value 1
Value 0
Mask
Mask
Mask
Mask
=
=
=
=
4 Bytes based on offset value

FIG. 10A

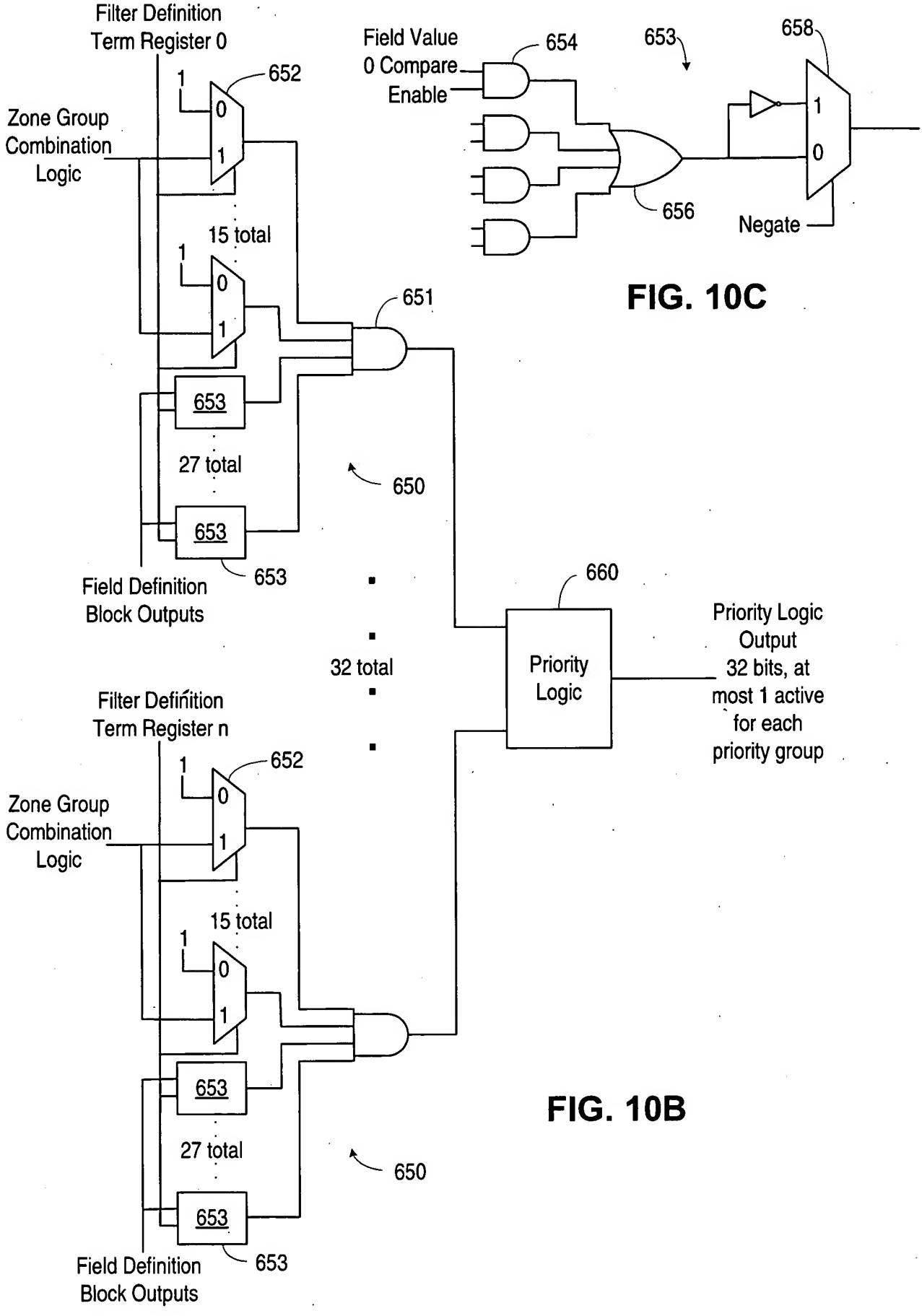


FIG. 10C

FIG. 10B

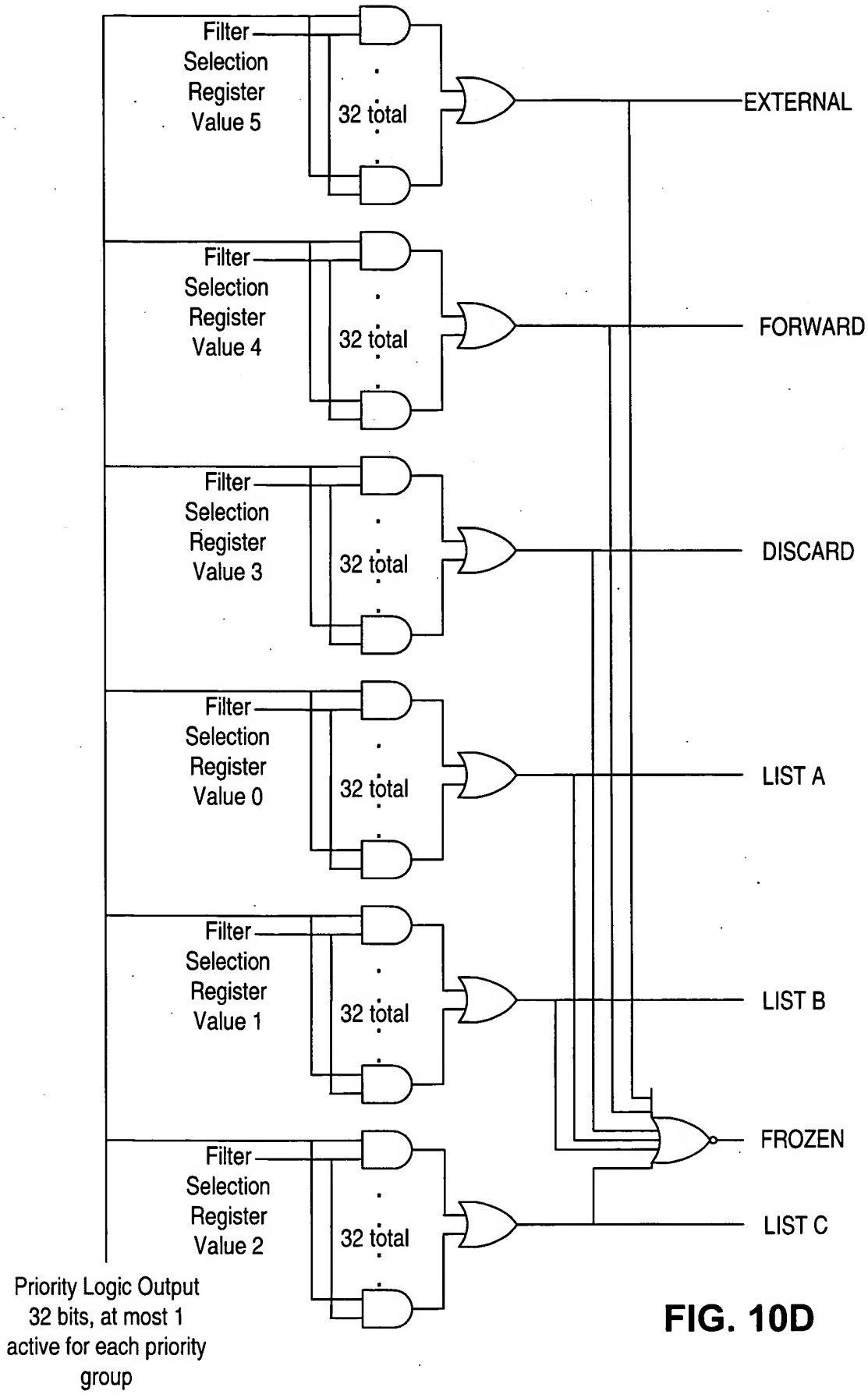

Filter Selection Register Value 5
32 total
EXTERNAL
Filter Selection Register Value 4
32 total
FORWARD
Filter Selection Register Value 3
32 total
DISCARD
Filter Selection Register Value 0
32 total
LIST A
Filter Selection Register Value 1
32 total
LIST B
FROZEN
Filter Selection Register Value 2
32 total
LIST C
Priority Logic Output 32 bits, at most 1 active for each priority group

FIG. 10D

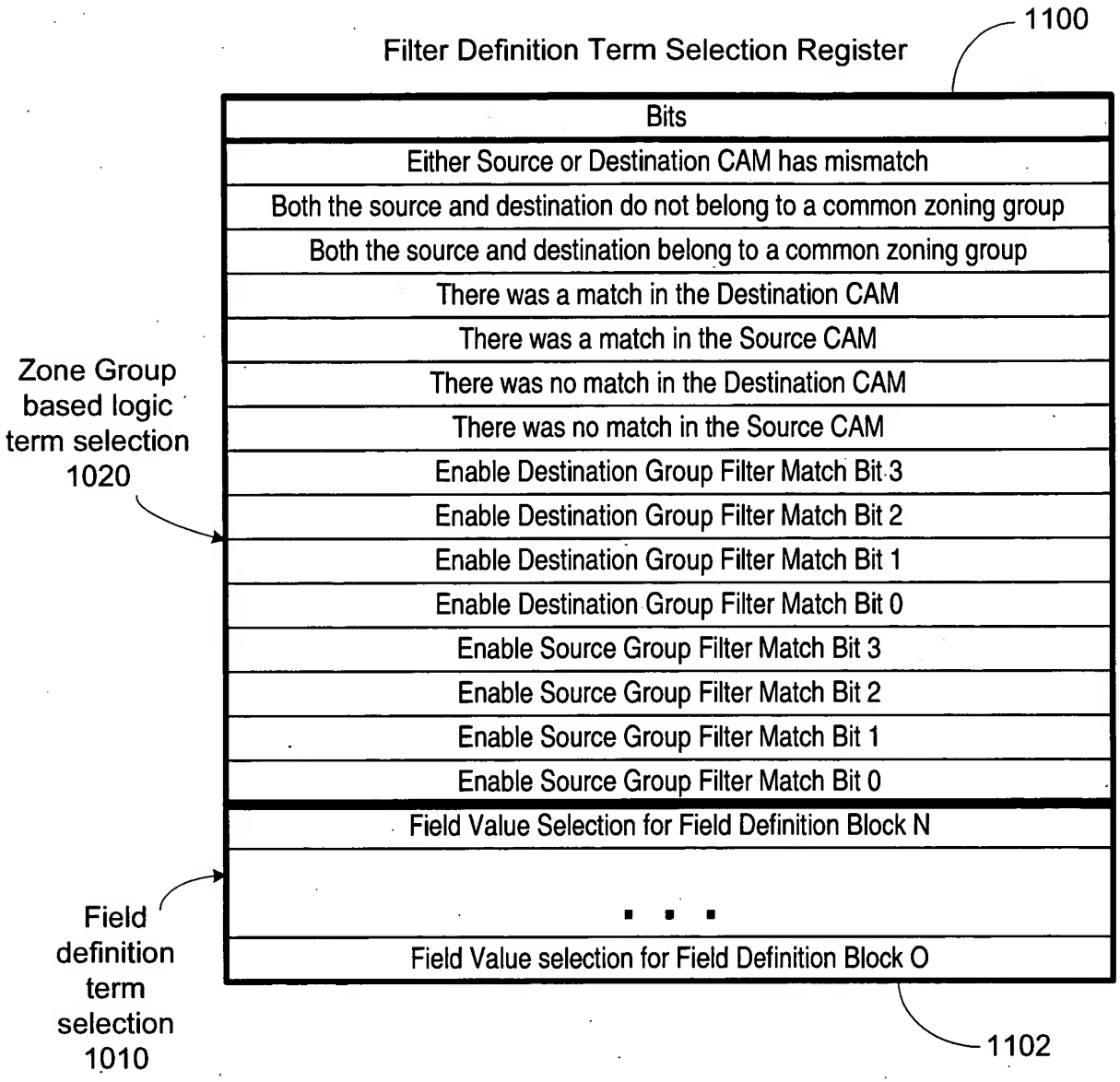

1100
Filter Definition Term Selection Register
Bits
Either Source or Destination CAM has mismatch
Both the source and destination do not belong to a common zoning group
Both the source and destination belong to a common zoning group
There was a match in the Destination CAM
There was a match in the Source CAM
There was no match in the Destination CAM
There was no match in the Source CAM
Enable Destination Group Filter Match Bit 3
Enable Destination Group Filter Match Bit 2
Enable Destination Group Filter Match Bit 1
Enable Destination Group Filter Match Bit 0
Enable Source Group Filter Match Bit 3
Enable Source Group Filter Match Bit 2
Enable Source Group Filter Match Bit 1
Enable Source Group Filter Match Bit 0
Field Value Selection for Field Definition Block N
. . .
Field Value selection for Field Definition Block O
Zone Group based logic term selection 1020
Field definition term selection 1010
1102

FIG. 11A

Filter	R_CTL	D_ID	S_ID	FC_TYPE	FCP_LUN	FCP_CMD	Action	Comment
1		Dest. device	List of all allowed sources	BLS			Forward	ABTS, etc.
2		Dest. device	List of all allowed sources	ELS			Forward	PLOGI, PRLI, etc.
3	Unsolicited cmd	Dest. device	List of sources which may read	FCP	List of dest. LUNs	FCP_READ	Forward	Read I/O
4	Unsolicited cmd	Dest. device	List of sources which may write	FCP	List of dest. LUNs	FCP_WRITE	Forward	Write I/O
5	Unsolicited cmd	Dest. device	List of allowed sources	FCP		Neither FCP_READ nor FCP_WRITE	Send to processor	Report LUNs, Mode select
6	Status (resp)	Dest. device	List of allowed sources	FCP			Forward	Responses
7	Solicited data	Dest. device	List of allowed sources	FCP			Forward	Data frames
8	No match to any filter						Class 3: discard Class 2: send to processor	Illegal access: discard (class3) or reject (class 2)

FIG. 11B

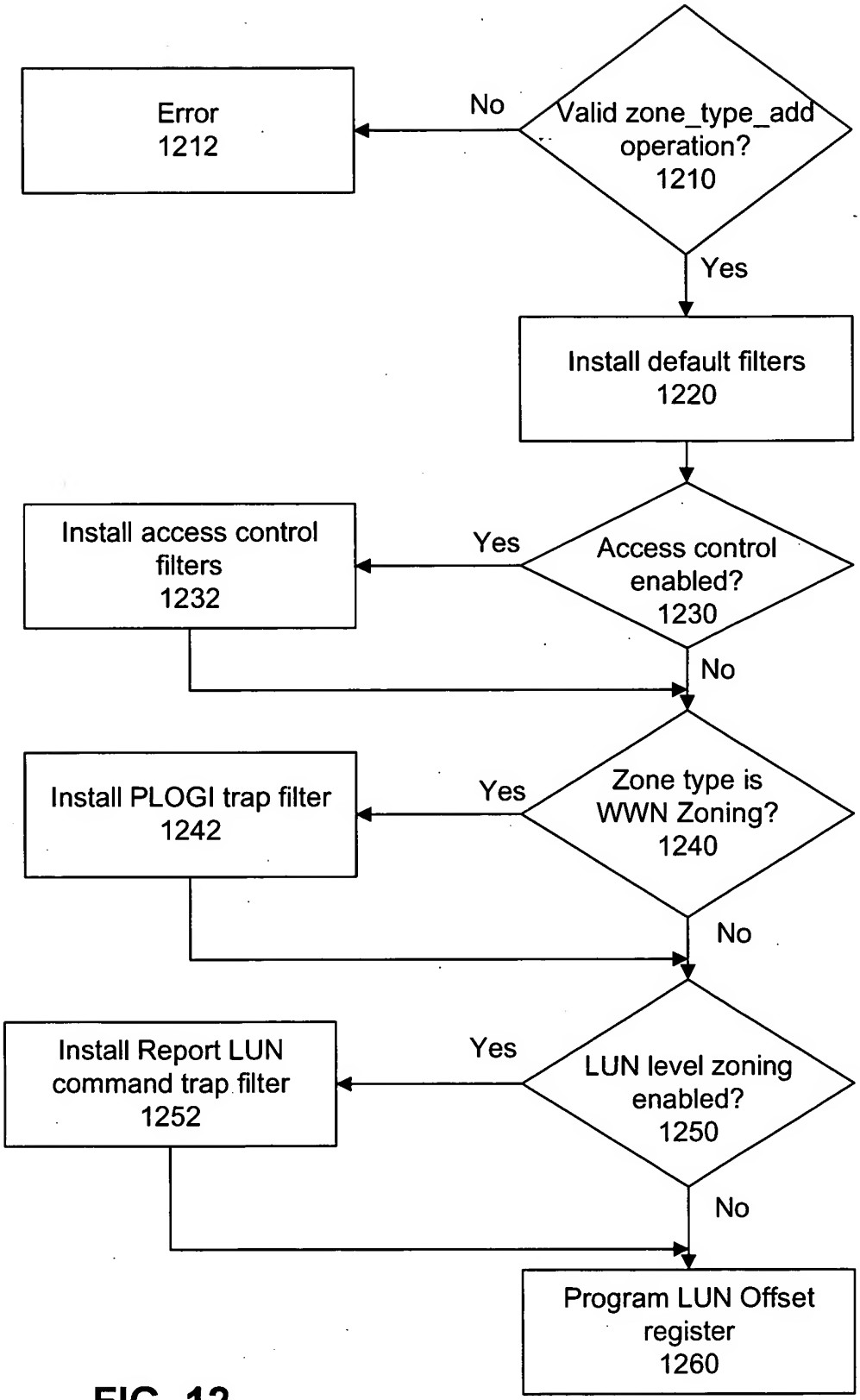

Valid zone_type_add operation?
1210
No
Error
1212
Yes
Install default filters
1220
Access control enabled?
1230
Yes
Install access control filters
1232
No
Zone type is WWN Zoning?
1240
Yes
Install PLOGI trap filter
1242
No
LUN level zoning enabled?
1250
Yes
Install Report LUN command trap filter
1252
No
Program LUN Offset register
1260

FIG. 12

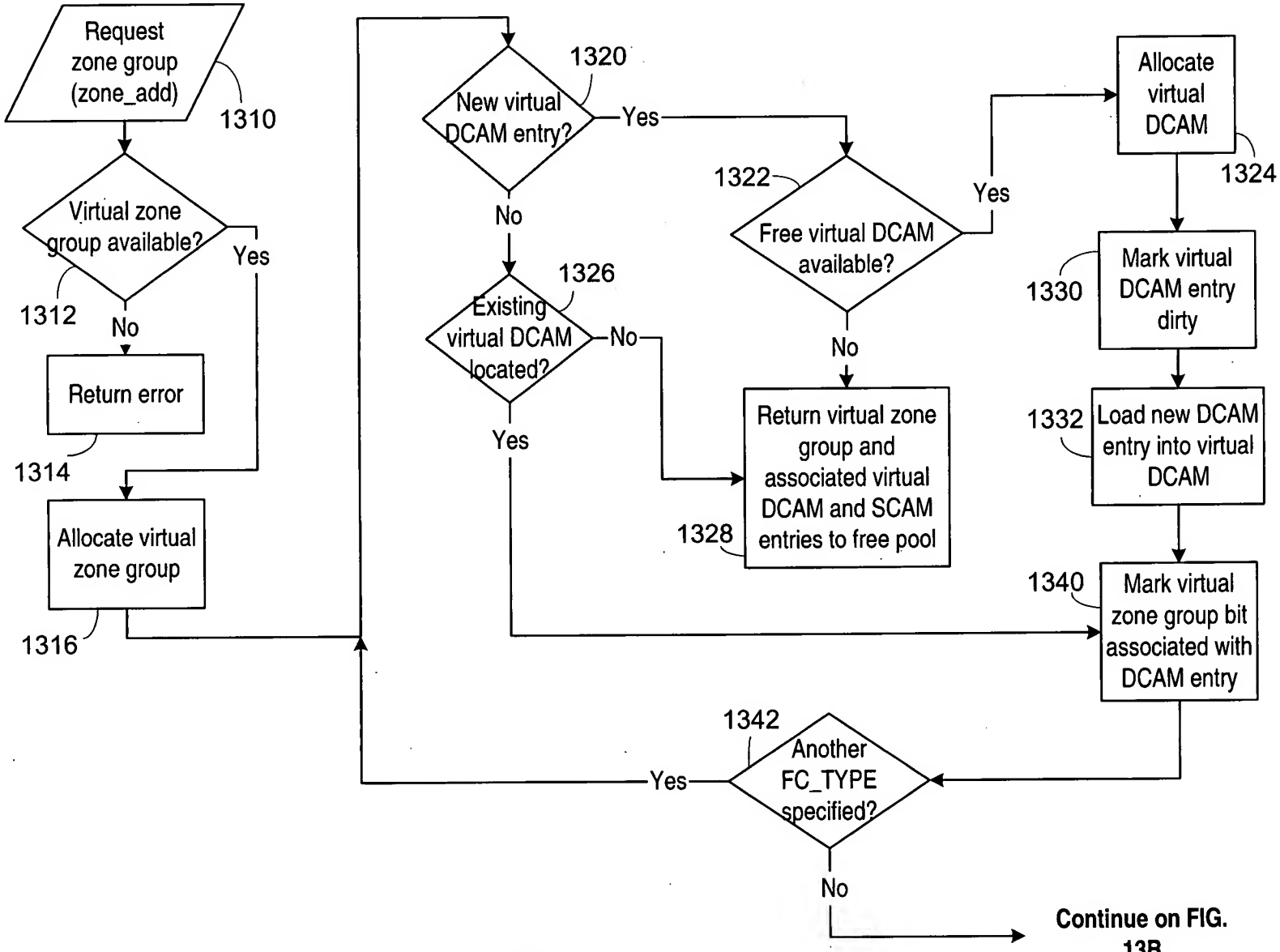

Request zone group (zone_add)
1310
Virtual zone group available?
1312
No
Yes
Return error
1314
Allocate virtual zone group
1316
New virtual DCAM entry?
1320
Yes
No
Existing virtual DCAM located?
1326
No
Yes
Free virtual DCAM available?
1322
Yes
No
Return virtual zone group and associated virtual DCAM and SCAM entries to free pool
1328
Allocate virtual DCAM
1324
Mark virtual DCAM entry dirty
1330
Load new DCAM entry into virtual DCAM
1332
Mark virtual zone group bit associated with DCAM entry
1340
Another FC_TYPE specified?
1342
Yes
No
Continue on FIG. 13B

FIG. 13A

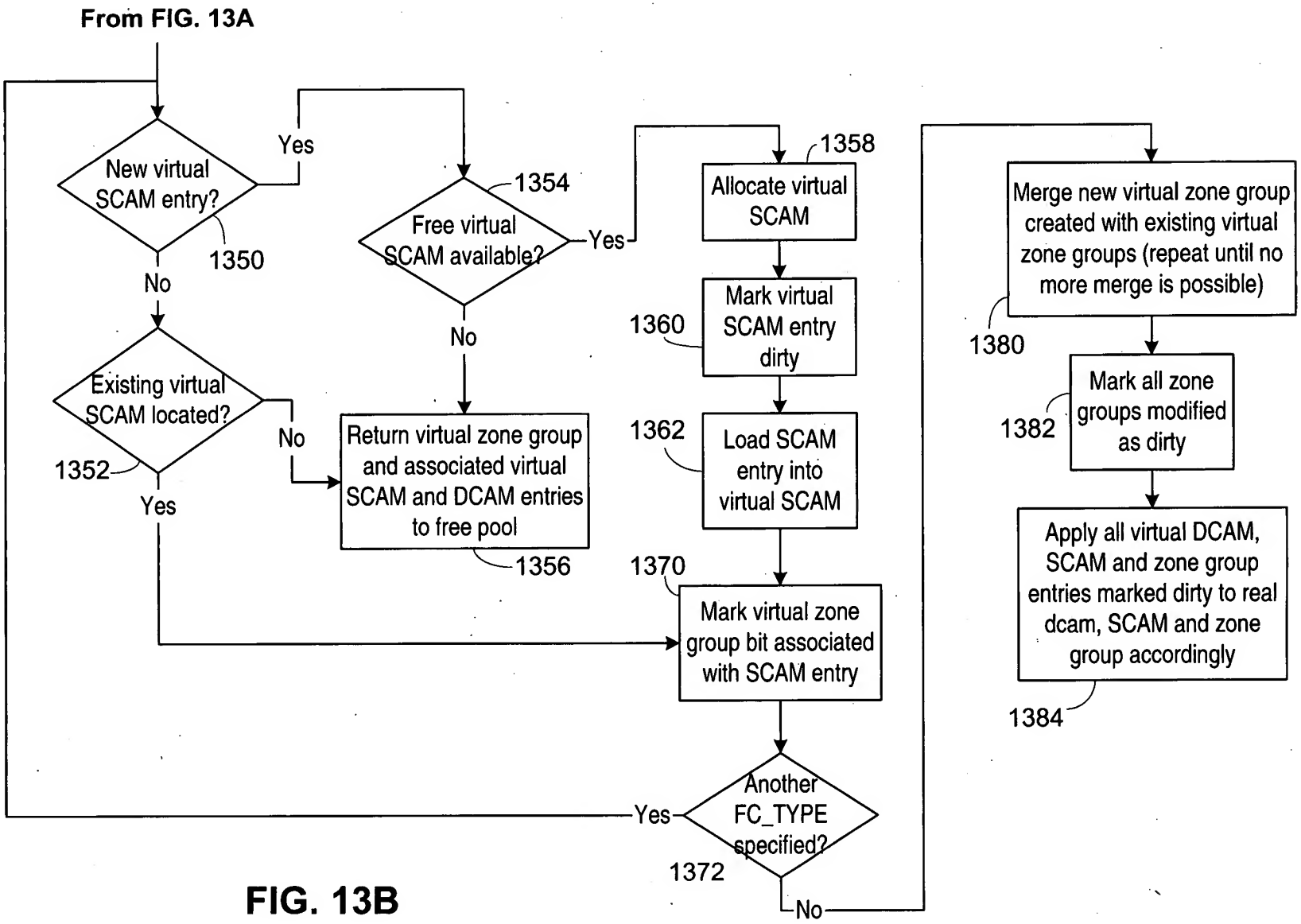

From FIG. 13A
New virtual SCAM entry?
1350
Yes
No
Existing virtual SCAM located?
1352
No
Yes
Free virtual SCAM available?
1354
Yes
No
Return virtual zone group and associated virtual SCAM and DCAM entries to free pool
1356
Allocate virtual SCAM
1358
Mark virtual SCAM entry dirty
1360
Load SCAM entry into virtual SCAM
1362
Mark virtual zone group bit associated with SCAM entry
1370
Another FC_TYPE specified?
1372
Yes
No
Merge new virtual zone group created with existing virtual zone groups (repeat until no more merge is possible)
1380
Mark all zone groups modified as dirty
1382
Apply all virtual DCAM, SCAM and zone group entries marked dirty to real dcam, SCAM and zone group accordingly
1384

FIG. 13B

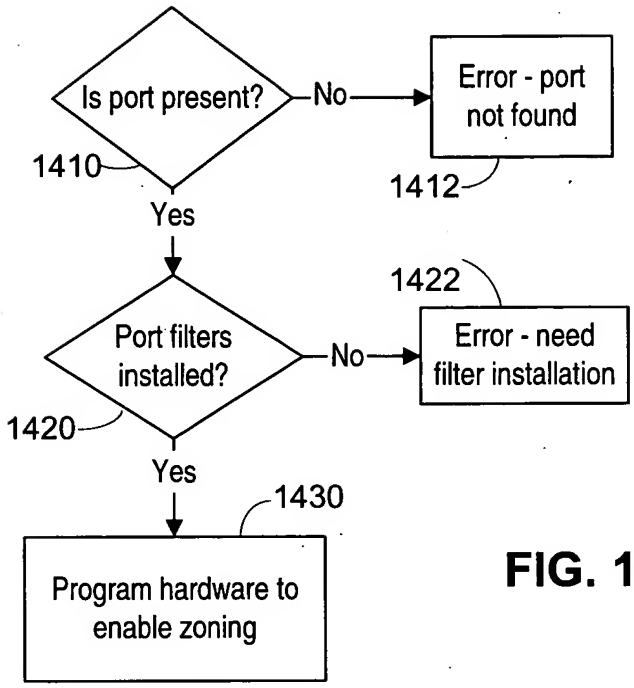

Is port present?
No
Error - port not found
1410
1412
Yes
1422
Port filters installed?
No
Error - need filter installation
1420
Yes
1430
Program hardware to enable zoning

FIG. 14

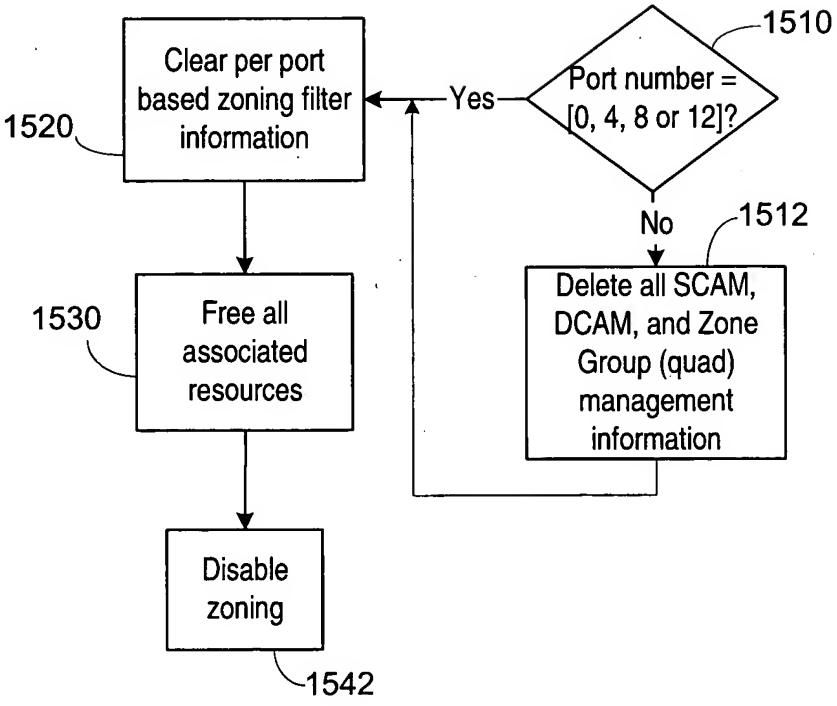

1510
Clear per port based zoning filter information
Yes
Port number = [0, 4, 8 or 12]?
1520
No
1512
Delete all SCAM, DCAM, and Zone Group (quad) management information
1530
Free all associated resources
Disable zoning
1542

FIG. 15

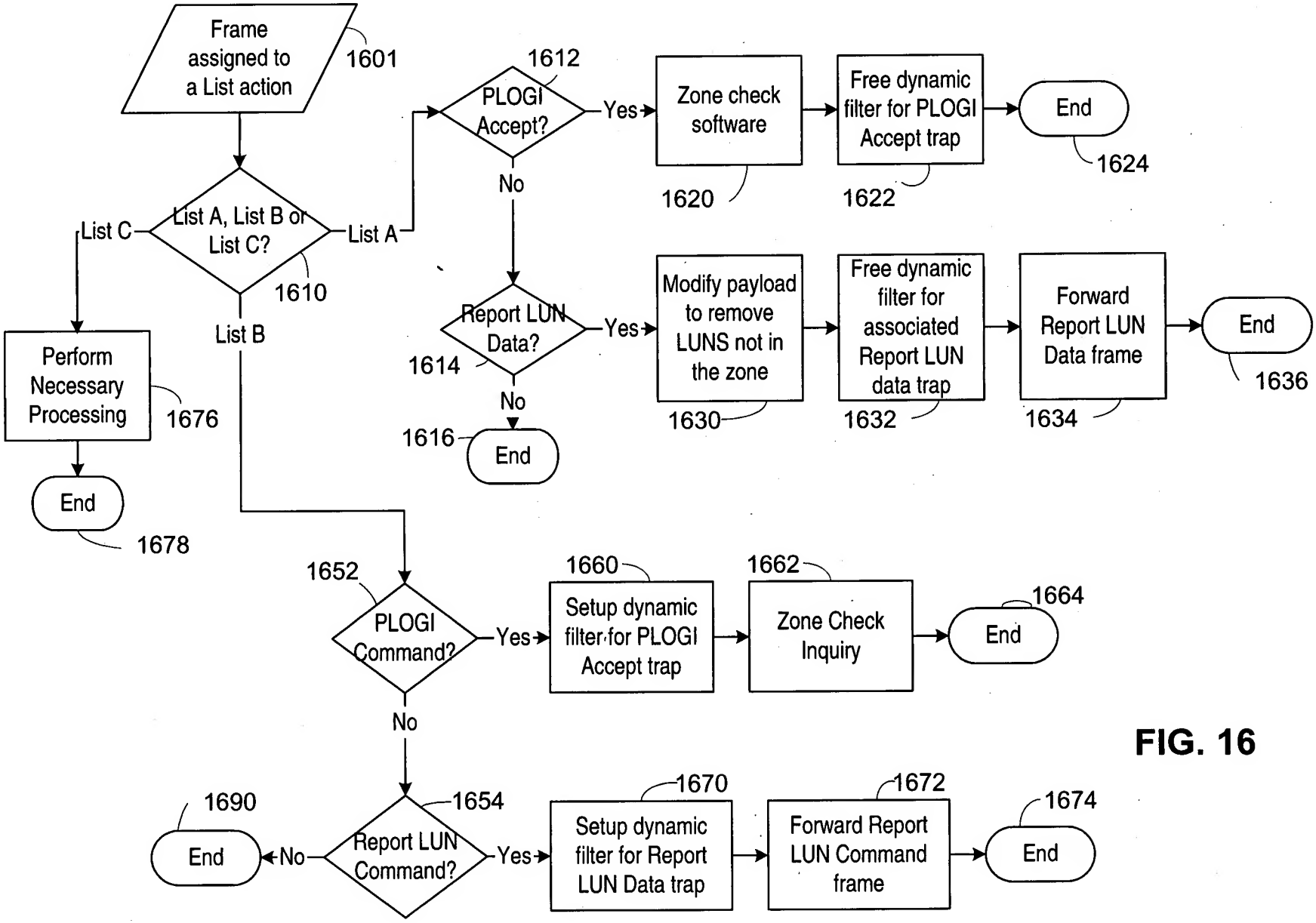

Frame assigned to a List action
1601
List A, List B or List C?
1610
List C
List A
List B
Perform Necessary Processing
1676
End
1678
PLOGI Accept?
1612
Yes
No
Zone check software
1620
Free dynamic filter for PLOGI Accept trap
1622
End
1624
Report LUN Data?
1614
Yes
No
1616
End
Modify payload to remove LUNS not in the zone
1630
Free dynamic filter for associated Report LUN data trap
1632
Forward Report LUN Data frame
1634
End
1636
PLOGI Command?
1652
Yes
No
Setup dynamic filter for PLOGI Accept trap
1660
Zone Check Inquiry
1662
End
1664
Report LUN Command?
1654
No
1690
End
Yes
Setup dynamic filter for Report LUN Data trap
1670
Forward Report LUN Command frame
1672
End
1674

FIG. 16

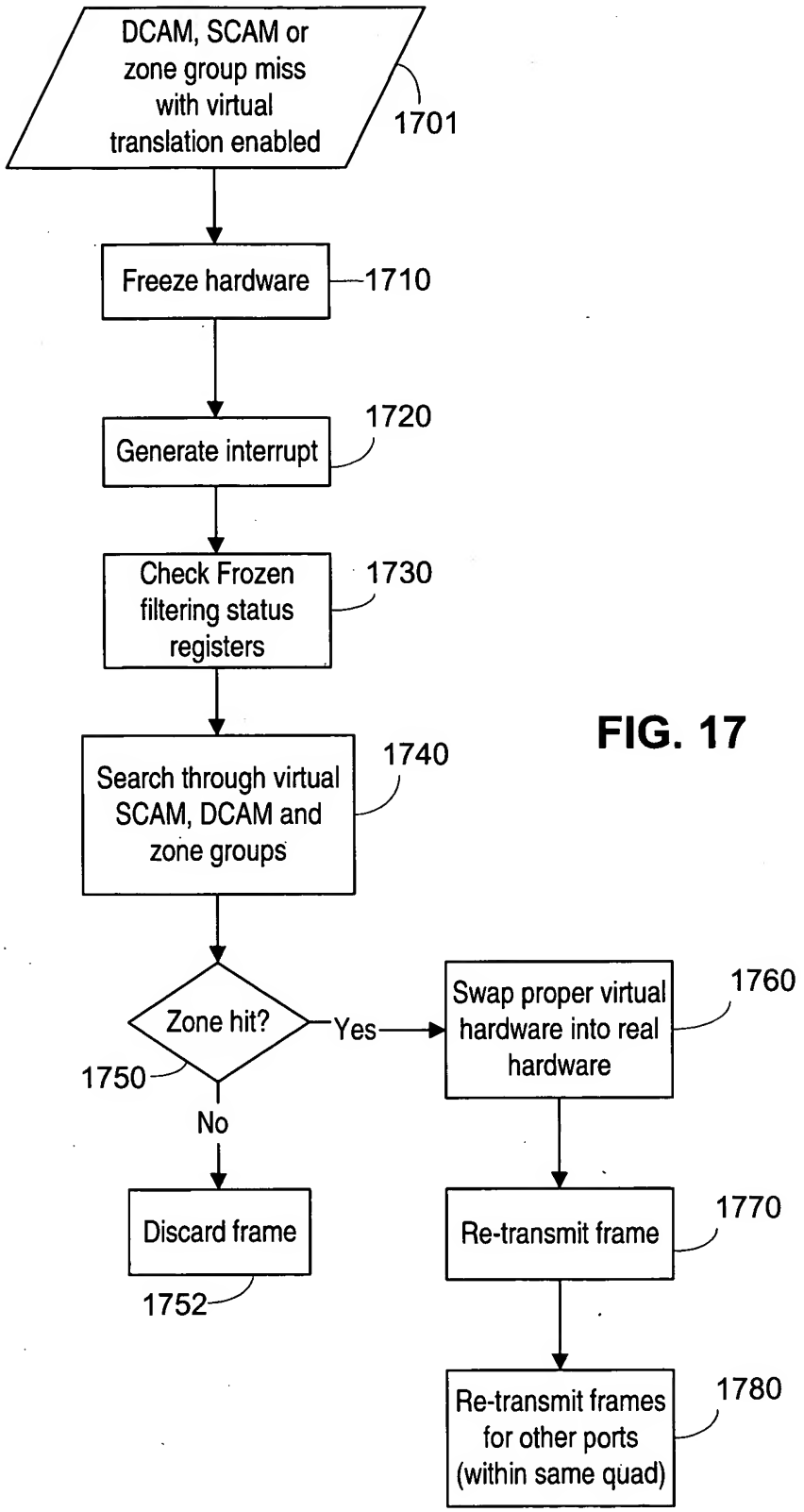

DCAM, SCAM or zone group miss with virtual translation enabled
1701
Freeze hardware
1710
Generate interrupt
1720
Check Frozen filtering status registers
1730
Search through virtual SCAM, DCAM and zone groups
1740
Zone hit?
1750
Yes
No
Swap proper virtual hardware into real hardware
1760
Discard frame
1752
Re-transmit frame
1770
Re-transmit frames for other ports (within same quad)
1780

FIG. 17